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PHYSICAL AND MEDICAL ASPECTS OF LABOR AND INDUSTRY

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Economics of Longevity.—The most valuable possessions of a workman are his health, strength and intelligence. The conservation of health and strength, the prolongation of life and prevention of disease are important economic factors which more or less determine the success of nations in the struggle for commercial supremacy and race survival. A gain in longevity, an increase in vitality, a decrease in disease liability, are all economic elements of the greatest possible economic importance. They lie at the root of the true labor problem, for they determine in the long run the real and enduring progress, prosperity and wellbeing of the masses. I can only touch upon a few essentials of this problem to emphasize the importance of the subject which should receive more intelligent consideration in the future than it has received in the past.

Physical Basis of Industrial Efficiency.—As it has been well said by Marshall, in his "Principles of Economics," health and strength, physical, mental and moral, are the basis of industrial efficiency, on which depends the production of material wellbeing. The same writer points out also that "In estimating muscular strength, or, indeed, any other kind of strength, for industrial purposes, we must take into account the number of hours in the day, the number of days in the year, and the number of years in a lifetime, during which it can be asserted." Upon this theory the problems of health and life have a sound economic basis, and in proportion as life is long or short, healthy or impaired by disease, the industrial efficiency of the individual must vary within limits which are subject to at least approximately accurate calculations.

Life Period of Industrial Activity.—The period of industrial activity of wage-earners generally, but chiefly of men employed in mechanical and manufacturing industries, it may be assumed, should properly commence with the age of fifteen and terminate at sixty-five. This gives fifty years of labor and life, during which, as the result of individual effort, primarily, of course, for self-mainten-

ance and the support of others, some net addition is annually made to the accumulated wealth of the nation. The large variety of employments, which is so characteristic of modern nations, and the increasing subdivision of labor and the development of special ability, precludes more than an approximate estimate of what normally constitutes the economic gain to society during the period of industrial activity of a wage-earner.

Economic and Social Value of Life.—The usual method has been to confuse cause and effect and to estimate the present value of a workingman's life merely upon the basis of his future earnings after deducting the cost of future maintenance. This method, however, does not establish the economic value of men to society, but rather the social value of a man to himself and his family or survivors. The economic gain to society, as I view it, is rather the value of the product over and above wages, cost of supervision, cost of material and miscellaneous expenses, necessarily incurred to carry on any particular process of manufacture or industry. A fairly accurate basis for an estimate of this kind is furnished by the census returns of our manufacturing industries, which give employment to some seven million persons. While any calculation of this character must necessarily be merely approximate, it, however, will prove useful for the present purpose, to establish the principle that there is an economic value inherent in every year of a workman's life, and that every gain in human longevity above the age of fifteen and below the age of sixty-five represents a corresponding gain to the nation at large and a distinct contribution to the accumulated wealth and capital of the nation.

Variations in Industrial Efficiency.—It is probably safe to assume that the net gain to society is at least equivalent to about three hundred dollars per annum in the case of male wage-earners employed in American manufacturing and mechanical industries. The return is higher, among others, in the manufacture of food and kindred products, also in the manufacture of metal ware, paper, printing and chemicals. It is lower, among others, in the manufacture of textiles, leather, clay, glass, stone ware and tobacco. Making allowance also for the lower wages of women and the relatively small earnings of children below the age of fifteen in industries, which are included in the census returns, the average of three hundred dollars, assumed for the present purpose, would

appear to fairly correspond to the facts of actual experience. Of course, the gain is less at the younger ages and probably remains fairly the same or level during the ages of thirty to fifty, when the normal physical strength is enhanced by practical trade education and experience. After the age of fifty a natural decline in physical strength and possibly of brain weariness gradually decreases the industrial efficiency, which in the case of wage-earners may be held to come practically to an end by about the age of sixty-five to seventy. There are, of course, always some exceptions in every trade and industry, where men continue to work, sound in body and mind, to the close of a long life.

Economic Loss by Premature Mortality.—Upon the assumption of an average annual net gain to society of three hundred dollars as the result of individual labor applied to American industry under normal conditions, the degree of variation in value may be placed between a minimum of seventy-five dollars at the age of fifteen and a maximum of four hundred dollars at the age of thirty-two. The value is then assumed to remain about the same, or level, until the age of forty-eight, when industrial efficiency gradually declines as the result of decreasing strength and mental aptitude and inclination. The minimum value at the end of industrial life is assumed to be one hundred and seventy dollars. By means of this estimate, which, of course, is purely theoretical, in that there are no wage statistics by ages, or useful observations of employers of labor respecting the industrial efficiency of employees at different periods of life, it is possible to calculate with approximate accuracy the economic loss due to premature death or impaired physical efficiency as the result of illness. If, upon the basis of an average net gain to society of three hundred dollars per annum, the fifty active years of a workingman's life represent a total of fifteen thousand dollars, then if death should occur at the age of twenty-five, the economic loss to society would be thirteen thousand, six hundred and ninety-five dollars; if at the age of thirty-five it would be ten thousand, three hundred and ninety-five dollars; if at the age of fifty, four thousand, four hundred and five dollars; and, finally, if at the age of sixty, the loss would still be one thousand and ninety dollars. Of course, the values would vary considerably in different employments, but the broad principle is fairly well illustrated and with approximate accuracy in this calculation. (See Appendix I.)

Problem of Preventive Medicine.—If this theory is applied to the problem of preventive medicine and vital statistics, some extremely suggestive conclusions result from a careful study of the facts. Out of every thousand males living at the age of fifteen (which I have assumed to represent the age of entry into active industry, since the decay of the system of apprenticeship, the modern theory of industrial education and the legislative efforts to minimize the evils of child labor, tend separately or in combination to raise the age at which work actually commences), by the last English life table, four hundred and forty-four will survive to the age of sixty-five, while five hundred and fifty-six will have fallen out, or have died, in the meantime, as the result of either accidents or disease. (Appendix VI.) The present consideration takes into account only the five hundred and fifty-six out of every thousand who die between the age of fifteen and sixty-five from causes which, by modern standards of medicine and hygiene, are largely of a preventable nature. This theory is readily susceptible of statistical proof, but it needs merely to be pointed out that the mortality from some of the most important of these causes, such as consumption, typhoid fever and industrial accidents, is more or less decreasing in all civilized countries on account of the more effective methods of private and public hygiene, on the one hand, and of successful medical treatment and surgery on the other.

Preventable Mortality from Tuberculosis and Accidents.—At the ages of fifteen to twenty-nine among American males nearly 32 per cent. of the deaths are caused by tuberculosis, while in addition 15 per cent. are caused by accidents and 8 per cent. by typhoid fever. It is not going too far to say that in the light of present knowledge and past experience at least one-half of this mortality is strictly preventable and subject to a material reduction under a more rational and deliberate method of social reform. At the ages of thirty to forty-five among American males about 27 per cent. of the deaths are caused by tuberculosis, 12 per cent. by accidents and 4 per cent. by typhoid. A very large proportion of these deaths are strictly preventable, and the mortality therefrom is subject to a material reduction under a more rational method of industrial and public hygiene. At the ages of forty-five to sixty 14 per cent. of the mortality of American males is caused by tuberculosis, 7 per cent. by accidents and about 2 per cent. by typhoid fever. At this period

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of life the proportion of deaths due to strictly preventable causes is less than at the younger ages, but there remains a sufficient margin towards which efforts should be directed tending to a substantial and deliberate increase in the length of human life.

Preventable Mortality from Other Diseases.—There are numerous other causes of lesser importance which cannot very well be discussed at length, but among which I may mention the needlessly large mortality from rheumatism, alcoholism and diseases of the liver, all intimately connected with erroneous habits of living and to a considerable extent the result of intemperance. Another class of diseases which are more or less preventable are bronchitis and asthma, of which a considerable proportion are due to unhygienic and generally unsatisfactory methods of factory life. The problem of disease prevention rests, therefore, primarily upon a clear recognition of the principal causes conducive to ill-health and short life and an intelligent study of the methods and means by which such causes can be most effectively removed.

Problems of Trade Diseases.—The fact that there has been a decrease in the general death rate is of small significance from an economic point of view, since the change almost entirely affects the very young, or children below the age of five years. At all ages over fifty there has been an increase in the specific death rate, if a comparison is made between the years 1890 and 1900. The problem, however, concerns the population in detail rather than in the aggregate, and if the mortality data for specified occupations can be relied upon, in many important employments the death rate is higher to-day than in the past.¹ It requires no very extensive inquiry to establish the fact that the mortality, disease and accident liability varies widely in different employments. There are well known trade diseases, such as potters' asthma, miners' consumption, hatters' shakes, painters' colic, etc., which draw attention to the facts of occupation diseases. Great calamities in mining, shipping or transportation by rail attract public notice, but the aggregate loss of life from accidents in industry is only reflected in the annual returns. Yet each life of an individual worker has an economic value and each death below sixty-five means a distinct and calculable economic loss to the nation.

Occupation and Tuberculosis.—Few subjects have, during recent

¹ Appendix VI.

years, attracted more general attention than the mortality from consumption, a disease largely preventable by proper methods of personal and public hygiene, including under the latter term the hygiene of factories and the medical supervision of factory methods. Among carpet and rug makers, for illustration, at the ages of fifteen to thirty-four, consumption is the cause of from 60 to 80 per cent. of the deaths from all causes; among glassmakers at the ages of twenty-five to forty-four from 40 to 52 per cent. of the deaths are from this cause; among hatters at the ages of fifteen to forty-four the proportion varies from 42 to 52 per cent.; among potters at the ages of twenty-five to forty-four the proportion is from 36 to 47 per cent.; among stone workers at the ages of fifteen to fifty-four the proportion is from 33 to 56 per cent; and, finally, among common laborers it is highest at twenty-five to thirty-four, when this disease is the cause of 37 per cent. of the mortality from all causes. Now, there can be no question of doubt but that at least one-half of the present mortality from consumption can be eliminated by intelligent but energetic methods, supplemented by practical education as to the facts and nature of the disease. The economic gain to the nation at large and to employers of labor in particular would be enormous. In addition, the social value of a longer and happier life, of a prolonged period of industrial efficiency, would be incalculable. (Appendix VII.)

Occupation and Respiratory Diseases.—In addition to the excessive mortality from tuberculosis shown to prevail among industrial workers, the various diseases of the respiratory organs cause a large mortality, chiefly among persons employed in dust-producing occupations. Potters, glass workers and coal miners are typical illustrations of employments still carried on under conditions which fall far below present standards of social and sanitary regulations. Among potters the proportion of deaths from tubercular diseases is about 28 per cent. of the entire mortality at all ages. But in addition, asthma, bronchitis and pneumonia and other respiratory diseases cause nearly 20 per cent. of the deaths, so that in the aggregate nearly one-half of the mortality of this class of industrial workmen is the result of either tuberculosis or of other diseases of the lungs and air passages. Among coal miners tuberculosis is the cause of a relatively low proportionate mortality, due primarily to the fact of an excessive accident liability falling heavily upon the younger

ages. In the aggregate, however, one-third of the entire mortality among coal miners is the result of either tuberculosis or of other acute and chronic diseases of the lungs and air passages. Rational inquiry into the underlying causes responsible for this deplorable condition along the lines indicated by the work of the Royal Commission of Western Australia on ventilation of mines, would suggest methods and means by which a considerable amount of the present waste of health and life could be avoided. (Appendix VIII.)

Occupation and Industrial Accidents.—Industrial accidents, next to tuberculosis, require serious consideration. Accidents to life and limb are in many cases the result of criminal recklessness and inhuman indifference to the welfare of others, demanding drastic government interference and regulation. The railway service, coal mining, metal mining, quarrying, navigation on inland waters, the Great Lakes and the high seas, electrical industries and many other occupations are subject to a much greater accident liability than would seem necessary when all the facts and conditions are taken into account. Fatal accidents in coal mining, among others, are relatively more frequent to-day than twenty years ago, and the same is true of fatal accidents in connection with the various methods of transportation. Even where the accidents are not fatal, they very often leave the injured person in a seriously crippled condition or otherwise incapacitated for an active and industrious life. Much of the existing poverty is the result of the death or incapacity of the bread-winner, and thus, from both an economic and social point of view, the prevention of industrial accidents, as far as this is possible without too serious interference with industrial processes or methods of management, becomes an imperative government duty. To place the value of human life at five thousand dollars by a jury verdict involves often a serious economic error, in that the true economic value of the life lost or impaired is, as a matter of fact, much greater, aside from its additional social value to surviving members of the family, who are often left dependent upon private charity or public aid. (Appendix IX.)

Dangerous Trades.—The importance of accident prevention is reflected in the vital statistics of men employed in certain dangerous occupations. Probably the most exposed class of industrial workers are the Gloucester fishermen, among whom the average fatal accident rate during the last decade has been 13.2 per thousand per

annum. Another extremely dangerous occupation is that of railway brakemen, who are mostly young men, below the age of thirty. Among this class at the ages of fifteen to twenty-four from 75 to 85 per cent. of the deaths from all causes are due to accidents, the large majority of which are the direct results of the employment. Railroad engineers experience the highest accident liability at the ages of twenty-five to thirty-four, when from 65 to 75 per cent. of the deaths are due to fatal accidents, chiefly the result of the occupation. Electric linemen are subject to an extra hazard, which varies from 65 per cent. of the entire mortality at the ages of fifteen to twenty-four to about 30 per cent. at the ages of thirty-five to forty-four. Coal miners at all ages are exposed to serious dangers which average from 20 to 25 per cent. of the deaths from all causes at all ages, but the variation in the accident liability at different periods of life is from 50 to 60 per cent. at the ages of fifteen to twenty-four, to from 10 to 15 per cent. at the ages of fifty-five to sixty-four.

Economics of Accident Prevention.—Industrial accidents, as I have said, are not only the cause of a considerable and more or less preventable loss of life, but they add enormously to the burden of dependence and seriously impair industrial efficiency. The medical and surgical expenses alone must amount to millions of dollars annually, while the reduced efficiency of workmen incapacitated, crippled or otherwise injured, tends to reduce materially the income of the people as a whole and naturally hinders the largest growth of capital.

During 1904 on American railways engaged in interstate commerce 3,632 employees were killed, while 67,067 were injured. The extent of the injuries is not known, but ranges from minor degrees of impairment to total incapacity, and many are of such a character that death results within a few years. In American coal mines during 1904 1,968 employees were killed, while 4,053 were injured. The ratio of injured to killed is very much greater than in the case of railways, due, possibly, to a certain extent, to different methods in reporting non-fatal accidents. The liability to fatal injury, however, is in itself greater in coal mining than in the railway service, and if accidents happen they are, as a rule, fatal or of a very serious character. The social and economic aspects of coal mining accidents are emphasized by the fact that annually over 1,000 women are made widows, while over 2,000 children are made orphans. The

reason why the number of children is relatively small is, no doubt, chiefly because most of the accidents occur at comparatively young ages. It would be possible to estimate approximately the burden upon society as the result of such accidents involved in the maintenance of widows and orphans, most of whom are left more or less destitute and in circumstances which require outside aid. There is thus in addition to the impaired industrial efficiency of coal miners a large economic loss to the nation in the waste of life, part of which is unquestionably preventable, according to the qualified opinion of those who have made a study of mining accidents.

Economics of Preventable Sickness.—Sickness in one form or another, incapacity to work and gradual impairment of physical vigor are more insidious in effect than accidents, but, at the same time, most important factors in diminishing both social and economic efficiency. The importance of the subject is illustrated in the numerous and practically universal sick benefit associations established among workingmen upon their own initiative, as well as in the more recent development of what is known as health insurance, the principles and practice of which rest upon a fairly secure actuarial basis and partially established sickness experience. The average amount of sickness in weeks per annum varies considerably among different classes of workmen, but the facts are not as clearly established for this country as for some of the more important friendly societies of England, which for many years have had the benefit of qualified actuarial advice and supervision. The Bureau of Labor Statistics of New Jersey in an earlier investigation reported upon the annual amount of sick time lost among men in different occupations, but the results are not as conclusive as would be desirable. The economic importance of sickness is hardly less than its social aspects, for the loss of actual working time is only one of the evils; the drain upon the family resources to meet medical and other expenses requires also to be taken into account. According to Watson, who has exhaustively investigated the sickness experience of the Manchester Order of Unity of Odd Fellows, representative of English workingmen generally, the amount of sickness in weeks per annum enhances with increasing age. Between the ages of sixteen and nineteen the amount of sickness to be expected is not quite one week per annum, increasing gradually to two weeks per annum between the ages of forty-five and forty-nine, to four weeks per

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annum between fifty-five and fifty-nine, to twenty-five weeks per annum between seventy-five and seventy-nine, and to not quite thirty-nine weeks between the ages of ninety and ninety-four. (Appendix X.) The term sickness in old age, however, is, as a rule, equivalent to physical infirmities, and in the experience of English friendly societies what is called "sick pay" in old age, or after sixty-five or seventy, is for ordinary purposes the payment of a deferred annuity or an old age pension. Sickness as an economic factor, as indicated by the experience referred to, does not become of serious importance until about the age of fifty-five, when as much as one month out of twelve represents the degree of industrial inefficiency equivalent to the corresponding physical impairment or incapacity of the workman. The experience of friendly societies, however, underestimates the actual amount of prevailing sickness, since the funds of the society are not drawn upon except in cases sufficiently serious to conform to the established rules and usages of the society. Members often do not draw from the sick funds at all as a matter of personal pride, or through brotherly attachment to their respective lodges or associations. Thus it is shown that the economic aspects of sickness among industrial workmen assume more serious importance as age advances, but the true incidence of the prevailing rate of sickness among industrial workers can only be established by a more extensive inquiry in which the different trades or employments are sufficiently differentiated. It requires no very extensive investigation, however, to establish the fact that a very considerable amount of the prevailing sickness is strictly preventable and due in a large measure to unhygienic conditions of factory life or trades generally.

Problems of Industrial Hygiene.—A comprehensive and practical study of the diseases of occupation is, however, surrounded by many difficulties. Arlidge is one of the few authors who has succeeded admirably well in this field within the narrow limits of English industrial experience. Many of his conclusions, however, do not apply to American conditions. Arlidge had for his basis the decennial reports of the registrar-general on occupation mortality statistics, but the corresponding data published by the census office for the registration area of the United States are as yet far from being equally trustworthy. The localization of industry in the United States peculiarly demands special attention to this subject, and at the same time materially favors the opportunity for satis-

factory inquiry and report. Thus, among many illustrations, I may mention the concentration and local predominance of the slaughter house and meat packing industry at South Omaha, the iron and steel industry at McKeesport and Johnstown, Pa., the pottery industry at East Liverpool, Ohio, the manufacture of hats at Bethel, Conn., and Orange, N. J., the manufacture of glass at Tarentum, Pa., and Millville, N. J., the manufacture of cotton goods at Fall River and New Bedford, Mass., the manufacture of boots and shoes at Brockton, Mass., of silk at Paterson, N. J., of hosiery and knit goods at Amsterdam and Cohoes, N. Y., and of brass ware at Waterbury, Conn. Each of these localities has a vital interest in the health and longevity of its wage-earners, who often and in large numbers work under injurious health conditions which could be removed without serious difficulty if the facts were fully known and understood.

Scientific Basis of Occupation Diseases.—Scientific observations respecting the diseases of occupation (as distinct from industrial accidents) must primarily rest upon trustworthy vital statistics and the results of personal inquiry into the actual conditions of industrial life and labor. Arlidge very properly considered as a preliminary basis for his observations the conditions and circumstances of labor, including observations upon the choice of a trade, the continuity of employment, the varied health conditions in the same occupation, problems of factory site and construction, domestic industry, air of workshops, personal qualities of workers, sanitary habits of work-people, hereditary qualities of workers, racial peculiarities, duration of labor and the general effects of law and legislation with respect to factories and workshops. The chief subject of interest, however, which attracts attention is the pathology of dust inhalation. Dust in any one of its many and varied forms is without question the principal ill-health producing factor in industry. Every trade with an excessive mortality from consumption or diseases of the air passages is almost invariably an occupation in which more or less dust of an irritating character is inhaled during the operations connected with the process of manufacture. Arlidge studied in natural course the employments subject to the inhalation of dust of non-metallic, metallic and organic origin. Following these come the occupations in which the employee is subject to noxious vapors of animal, vegetable or inorganic origin. Finally in this branch of inquiry come the employments in which the workers are subject to

excessive temperatures, to electricity, to abnormal atmospheric pressure and to prolonged strain or friction. The subject is so vast that no one man can do it justice, and scientific co-operation in this field is a necessity. The co-operation of a large number of qualified experts is required, who of necessity will have to contribute to science the results of their observations without hope or expectation of pecuniary reward. But no field of inquiry gives promise of better results, no field is more truly humanitarian than this, for an earnest and impartial effort to establish the truth will lead with practical certainty to the discovery of principles which, if applied, will more materially advance the true cause of labor than any agitation for high wages or short hours.

Foreign Investigations Into Health Conditions of Industrial Life.—Primarily, however, it is the duty of the State, as circumstances require, to make occasional or periodical inquiry into the state of health and mortality of the population engaged in more or less unhealthy or dangerous trades or occupations. All social remedial legislation should rest upon a large and well-established basis of fact and observation, to eliminate a possibly unwarranted interference with the social and economic progress of the people. As illustrations of the proper method of inquiry, I may call attention to a recently published report of the Royal Commission on the Ventilation and Sanitation of Mines in the State of Western Australia, which was prepared by a commission which included the State mining engineer, the president of the central board of health, the chief inspector of explosives and government analyst, and several other members of scientific attainments and practical experience. Between 1893 and 1899 a number of important inquiries were made into the conditions of dangerous trades in the United Kingdom, prepared by an inter-departmental committee under the direction of the principal Secretary of State for the Home Department. The committee included the superintending inspector of factories, the physician to the royal infirmary and the chief inspector of factories for England, Scotland and Ireland. One of the most scientific and useful investigations of this character is a report on the use of phosphorous in the manufacture of lucifer matches, by Professor Thorpe, principal chemist of the government laboratory, and author of a standard treatise on industrial chemistry. Professor Thorpe was assisted by Professor Oliver, physician to the royal infirmary,

a recognized authority on dangerous trades and the author of a standard treatise on the subject. Dr. Cunningham, senior dental surgeon to the London Hospital, was one of the members who reported on the subject of dental caries, as resulting from industrial poisoning in the manufacture of matches. In 1899 there was published a special report on the causation and prevention of accidents at docks, wharves and quays, by Maitland and Erant, H. M. inspectors of factories, as a supplement to the regular report of the chief inspector for the year. Investigations of this character disclose conditions which rarely attract general attention and tendencies seriously detrimental to the welfare of the most deserving element of the population.

American Investigations Into Health Conditions of Industrial Life.—It is unfortunate that no similar investigations have been made in the United States. Occasionally the State labor bureaus publish brief reports upon local industries, but they are rather descriptive of the better class of establishments and generally make no reference to health-injurious conditions or tendencies. The reports of State factory inspectors are equally limited in value. There is no well-defined government policy with respect to dangerous or injurious health industries, and there can be no material improvement in existing conditions until our system of State factory inspection is made to rest upon a qualified medical basis. The subject, however, is gradually attracting the attention of legislative bodies, and in 1904 the legislature of Massachusetts adopted a resolution under which the State board of health was required to "investigate the sanitary conditions of factories and workshops and other employments in Massachusetts, with respect to all conditions which may endanger the life and limb or be prejudicial to the health of the persons employed therein." Only a small sum, however, was appropriated for the investigation, but a preliminary and instructive report was prepared for the information of the legislature, including observations in detail upon the cutlery and tool industry, stone-cutting and polishing, the tobacco, shoe, paper, textile, rubber and lead industries, etc. The report indicates the lines of inquiry to be followed in similar investigations in other States. A reasonably satisfactory method of inquiry into the subject of diseases and disease tendencies of industries has been adopted by the State Bureau of Labor Statistics of New Jersey, following investigations by the

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same bureau during the early nineties. In its report for 1905 the bureau reports at length upon the pottery industry, including observations upon every branch of the industry derived from personal inspection and the usual methods of official inquiry. As another indication of increasing attention to problems of factory sanitation and labor protection, I may refer to a report prepared under the direction of the United States Department of Labor by C. F. W. Doehring, published in the Bulletin of the department for January, 1903. In this report two principles are laid down, which, in the opinion of the author, are necessary for the successful protection of workmen in factories, and which require, first, systematic education in respect to the many dangers which in certain industries threaten the workmen and the public; second, the institution of technical preventive measures based upon a sound and practical as well as theoretical foundation, and whose aim should be to remove the causes of all existing evils injurious to health. In this report thirty-eight specific employments are enumerated in which injurious varieties of dust are more or less prejudicial to the health of the employees, and there is also a long list of the several poisons which enter into manufacturing processes and prove more or less injurious to the health of employees. Special consideration is given to the lead industry, chiefly the manufacture of white lead, with observations upon the symptoms of lead poisoning and suggestions for the improvement of the conditions of persons employed in the different branches of this industry. The author also considers at some length the oilcloth and linoleum industries, linseed oil manufacture, the manufacture of tallow, the fertilizer industry, etc. Reports and investigations of this nature have their value, but they are not sufficient for the purpose of remedial legislation having for its aim improvements in the sanitary and physical condition of labor on the one hand, and of an increase in industrial or economic efficiency on the other.

Changes and Tendencies in Industrial Methods—Industrial efficiency, as I have said at the outset, must in its final analysis rest upon the sound health, physical vigor and long life of the industrial population. As Marshall has pointed out, every year of life, in fact, every day of life, has its economic value. Labor conditions in the United States, it is true, are, on the whole, much more satisfactory than in foreign countries, but in many respects appearances are

deceptive, and the true state of affairs is not realized even by the workman himself. The real facts and tendencies of industrial life often escape observation and require to be established by means of a comprehensive and scientific investigation made by government authority. For purpose of illustration, I may mention that persons employed in potteries, glass workers, stonecutters and printers continue to work under more or less unsatisfactory conditions, much as these conditions have been improved during the last thirty years. The modern cotton factory, as it has been built in the South, illustrates forcibly the advance over the old granite mill of New England. The modern pottery eliminates much of the danger of lead poisoning, and there is every reason to believe that the modern tank furnace in glass manufacture is a decided improvement over the pot furnace, in that at least the frequent exposure to extreme heat in the setting of a new pot is done away with. One of the best illustrations of material improvements in the health conditions of modern industry is furnished by the roller process in flour milling, while the introduction of pneumatic tools in the stone-cutting industry has resulted in an increase in the disease liability and mortality of men employed in this occupation.

The underlying causes of ill-health and short life cannot be brought to light by superficial investigation or an inquiry limited to a few of the better class of establishments. The problems of proper housing, light, ventilation, food, drink, women workers, child labor, night workers, hours of labor, efforts at social betterment, etc., all require consideration for a full understanding of the problems of industrial efficiency as affected by conditions injurious to health and destructive to life. The facts are too involved and the issue is too important to be disposed of otherwise than by systematic inquiry and observations made by qualified experts in the different branches of industrial medicine and labor conditions.

Physical Standard of Fitness for Labor and Industry.—While on the one hand health is impaired and longevity curtailed by industrial conditions destructive to health and life, on the other the problem of industrial efficiency demands intelligent consideration of the physical condition of the employee and his physical fitness for a particular trade or occupation, both at the beginning of the trade life and during its continuance. No satisfactory standard of physical requirements for admission to different trades and occupations has

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as yet been established, but it is evident that such a standard would have its value in eliminating the physically unfit from recognized unhealthful or injurious employments. The same theory of physical fitness which underlies the physical and medical examination of recruits for the army or navy or of applicants for the police and fire department services, is applicable to industrial employments generally, provided the proper standard is established by means of a comprehensive and scientific inquiry. Qualified medical investigation would be necessary to establish the facts in connection with any particular industry, but primarily physical measurements require to be collected from a large number of individual workers in different occupations. A beginning in this direction was made by Baxter, who, during the Civil War, collected a considerable amount of material incidental to the measurement of army recruits. The most recent application of this theory is to be found in the reports of the inter-departmental committee on physical deterioration in the United Kingdom. The physical standard required to secure the highest degree of industrial efficiency, as measured by subsequent health and longevity, is necessarily very different in the case of a 'longshoreman, subject to exposure and over-strain, than in the case of a window glass blower, subject to exceptional chest expansion and exposure to extreme heat. As Arlidge has pointed out, heavy physical exercise, *per se*, is not necessarily prejudicial to health, and trades which require strong and moderate exercise are "far and away more healthy than others demanding little or no bodily effort." But we, as yet, know very little respecting the proper physical basis for industrial employments, and in perhaps no direction is scientific inquiry more demanded than in this.

British Committee on Physical Deterioration.—The British committee on physical deterioration was organized, first, "to determine, with the aid of such counsel as the medical profession are able to give, the steps which should be taken to furnish the government and the nation at large with periodical data for an accurate comparative estimate of the health and physique of the people; second, to indicate generally the causes of such physical deterioration as does exist in certain classes, and, third, to point out the means by which it can be most effectually diminished." It would be difficult to frame a more intelligent basis for an inquiry of this character, but for the specific object of determining the conditions

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of factory life or industrial employments generally, more or less detrimental to health and longevity, a still more comprehensive investigation would be required. The committee very properly called attention to the very narrow basis of fact from which to draw accurate conclusions with respect to the physical history of the British people. Such investigations as have been made have been of a rather fragmentary character, and the committee properly point out that what is required is "a permanent organization, not necessarily on a large or expensive scale, which, under expert direction, and in collaboration with the Department of State, shall be charged with the duty of collecting and tabulating facts which throw light upon the situation and thus provide means by which those interested in the subject may at any moment satisfy themselves of the progress of the nation one way or another." The committee say further that "every witness who was examined on the subject testified to the great value of such facts in determining questions relative to the physique of the people." Though opinions differed as to the amount and method of observation necessary, it was admitted on all hands that anthropometric records were the only accredited tests available, and that if collected on a sufficient scale they would constitute the supreme criterion of physical deterioration or the reverse.

American Problems of Labor Protection.—The American standard of life and intelligence guards in many ways against the evils which followed the introduction of the factory system in England and on the Continent. While the danger of actual industrial deterioration may appear remote, it is an ever-present contingency, but most so during a period of intense physical activity. More so is this the case when vast numbers of unlike races, chiefly natives of non-progressive countries with a low standard of life, enter into active competition with the trained intelligence of the predominating type tenaciously adhering to a higher standard of social and industrial progress. The workmen themselves, as it has often been pointed out by intelligent observers, cannot be supposed to judge fairly of their own condition in this respect. The employer is in a better position, and much can be done by him to effectively guard against conditions more or less destructive to life and health. The employer can make no better investment than to properly safeguard the life and health of workmen, and thus raise

the standard of individual wellbeing on the one hand and of industrial efficiency on the other. Every employer of labor whose workmen are subject to conditions more or less dangerous or destructive to health and life owes it as a primary duty to his workmen and the State that he should observe with care and intelligence the general conditions of life under which his industry is carried on, so that the risk of premature mortality or increased disease liability may be reduced to a minimum. It is something very considerably to the credit of modern industrial progress that this aspect of the labor problem has received a fair share of attention, and that what is included in the comprehensive term "welfare work" gives promise of excellent social and economic results to the advantage of both employer and employee. Only, however, as the economic importance of the subject is recognized and as the economic value of life and health to both the industry and the State are properly appreciated, will efforts in this direction become more general and tend to raise the level of health and life, and increase the industrial efficiency of individual workmen and the economic value of their labor to the State.

Recommendations for Scientific Inquiry and Report.—The field is so large and the problem so complex that definite suggestions and recommendations require to be made with extreme caution. Following, however, in part the plan of the inter-departmental committee on physical deterioration, and in part the consensus of opinion of authorities on the diseases of occupation, there would appear to be no disagreement as to the practical importance and social value of the following recommendations as a preliminary basis for wide-reaching and in some respects drastic reforms:

First. A scientific inquiry by a mixed commission of medical and other qualified experts, under Federal or State authority into the trade life and health of persons employed in the principal industries, for the purpose of determining with accuracy the existing conditions more or less detrimental to health, longevity and industrial efficiency.

Second. A national anthropometric survey more or less along the lines suggested by the inter-departmental committee on physical deterioration, but with special reference to the physical status of persons employed in industrial occupations for the purpose of establishing normal physical qualifications for industrial employments.

Third. The local registration of sickness supplementary to the

registration of deaths, or, where this is not possible, the registration of sickness and accidents of employees in all industrial establishments or occupations where at least five persons are employed. The registration should include the nature and duration of the disease, the age of the patient, the specific occupation, the length of trade life, and the medical opinion whether the accident or sickness was, or was not, the result of the employment.

Fourth. The systematic medical inspection of factories and workshops under the general direction of the State factory inspector, who should require periodical reports upon the general sanitary conditions of the employment, prevailing health conditions, dangerous branches of the trade, and supplemented by general observations upon existing circumstances or tendencies, more or less affecting the health and life of persons employed.

Fifth. Compulsory medical examination of all persons employed in industry under the age of twenty-one years. The medical examination should be at the time of commencing work, but should be followed annually by re-examinations to determine possible injurious effects upon health and life in the particular trade followed. A minimum standard of physical qualifications should be adopted, and persons falling below the standard should not be permitted to engage in trades more or less injurious or dangerous to health.

Conclusions.—The transcending economic and social importance of the health and physical status of labor in American industry warrants a well-defined government policy, more far-reaching in its power of inquiry and statutory requirements than the present methods of factory inspection and State supervision and regulation of industrial employment. My remarks and suggestions are chiefly for the purpose of indicating some of the more important aspects of the physical and medical problems of labor and industry and to direct attention to the enormous annual economic loss to the nation incurred in a needless waste of human effort and industry and in sacrifice of health and life. American workingmen require a better knowledge of the facts of industrial hygiene, which can be secured only through inquiry under government authority, and workingmen require to be better informed as to the conditions of industry injurious to health and life and contrary to the highest degree of industrial and social efficiency. The facts required cannot be obtained through individuals in as effective and comprehensive a manner as

by the government making use of the existing machinery of State, health, labor, factory and other organizations of a scientific character, such as the American Public Health Association, American Medical Association and kindred bodies. If the duration of life of workingmen has, on the average, the considerable economic value referred to at the outset, then it manifestly must be to the advantage of the State, and the employers of labor, that nothing within reason be left undone to raise to the highest possible standard the level of national physique and of health and industrial efficiency. That we are far from having attained to this standard is made evident by the still very considerable and needlessly large loss of life, attributable to tuberculosis, respiratory diseases and industrial accidents. The interests of the nation, of wage-earners as a class, and of society as a whole, transcend the narrow and selfish interests of short-sighted employers of labor, who, disregarding the teachings of medical and other sciences, manage industry and permit the existence of conditions contrary to a sound industrial economy and a rational humanitarianism. There can be no question of doubt but that at the present time the average life and industrial efficiency of a workingman in the United States is not what it should be, and it is manifestly the duty of the State, of employers of labor, of labor associations and of the workingmen themselves to take the facts of the problem into consideration and by intelligent co-operation raise to the maximum the standard of life and health in American industry.

I. THE ECONOMIC VALUE OF INDUSTRIAL LABOR AND LIFE

Age	Estimated Average Annual Economic Gain—\$200.		Estimated Average Annual Economic Gain—\$300.		Estimated Average Annual Economic Gain—\$500	
	Annual Net Economic Gain.	Estimated Future Economic Value.	Annual Net Economic Gain.	Estimated Future Economic Value.	Annual Net Economic Gain.	Estimated Future Economic Value.
15	\$50	\$10,000	\$75	\$15,000	\$90	\$25,000
16	60	9,950	90	14,925	120	24,910
17	70	9,890	100	14,835	140	24,790
18	80	9,820	110	14,735	175	24,650
19	90	9,740	120	14,625	200	24,475
20	100	9,650	130	14,505	200	24,275
21	120	9,550	140	14,375	225	24,075
22	140	9,430	160	14,235	250	23,850
23	150	9,290	180	14,075	300	23,600
24	160	9,140	200	13,895	350	23,300
25	170	8,980	225	13,695	400	22,950
26	180	8,810	250	13,470	425	22,550
27	190	8,630	275	13,220	450	22,125
28	200	8,440	300	12,945	500	21,675
29	225	8,240	325	12,645	550	21,175
30	250	8,015	350	12,320	600	20,625
31	275	7,765	375	11,970	650	20,025
32	300	7,490	400	11,595	650	19,375
33	300	7,190	400	11,195	650	18,725
34	300	6,890	400	10,795	650	18,075
35	300	6,590	400	10,395	675	17,425
36	300	6,290	400	9,995	675	16,750
37	300	5,990	400	9,595	675	16,075
38	300	5,690	400	9,195	675	15,400
39	300	5,390	400	8,795	675	14,725
40	300	5,090	400	8,395	675	14,050
41	300	4,790	400	7,995	675	13,375
42	300	4,490	400	7,595	665	12,700
43	300	4,190	400	7,195	650	12,035
44	300	3,890	400	6,795	650	11,385
45	300	3,590	400	6,395	650	10,735
46	300	3,290	400	5,995	650	10,085
47	300	2,990	400	5,595	650	9,435
48	300	2,690	400	5,195	650	8,785
49	300	2,390	390	4,795	650	8,135
50	275	2,090	380	4,405	625	7,485
51	250	1,815	370	4,025	600	6,860
52	225	1,505	360	3,655	575	6,260
53	200	1,340	350	3,295	560	5,685
54	175	1,140	345	2,945	550	5,125
55	150	965	330	2,600	540	4,575
56	140	815	310	2,270	530	4,035
57	130	675	300	1,960	520	3,505
58	120	545	290	1,660	510	2,985
59	100	425	280	1,370	500	2,475
60	80	325	260	1,090	475	1,975
61	70	245	240	830	450	1,500
62	65	175	220	590	400	1,050
63	60	110	200	370	350	650
64	50	50	170	170	300	300

II. COMPARATIVE LIFE TABLE OF 1,000 MALES AGED FIFTEEN YEARS.

Number Surviving at Each Age to Sixty-five.

Age.	English Life Tables.			Mass. Life Table. N. Y. City.		London Life Table. 1891-00.
	1838-54.	1871-80	1881-90.	1893-97.	1899-01.	
15	1,000	1,000	1,000	1,000	1,000	1,000
16	995	996	997	996	996	997
17	989	992	994	991	992	994
18	983	987	990	986	987	990
19	976	982	986	980	982	986
20	969	977	981	974	976	982
21	961	970	977	967	970	978
22	953	964	972	961	963	974
23	945	957	967	953	955	970
24	936	951	961	946	947	965
25	928	944	955	938	938	960
26	919	936	949	930	929	955
27	911	929	943	922	920	950
28	902	921	936	914	910	945
29	893	913	929	905	900	939
30	885	905	922	897	889	932
31	876	896	914	889	879	925
32	867	888	906	880	868	918
33	858	879	898	871	857	909
34	848	869	890	863	845	901
35	839	860	881	854	833	891
36	830	850	872	846	821	881
37	820	840	863	837	809	871
38	810	830	850	828	797	860
39	800	819	840	819	784	848
40	790	809	833	810	770	836
41	780	797	823	801	757	824
42	770	786	812	792	743	811
43	759	774	801	782	730	798
44	748	762	789	773	716	785
45	737	750	777	763	701	772
46	726	738	765	753	686	758
47	714	725	753	743	670	743
48	702	712	740	733	654	728
49	690	699	727	722	638	713
50	677	685	713	710	621	697
51	665	671	699	698	605	680
52	651	656	684	685	588	663
53	637	641	669	672	571	646
54	623	626	654	659	553	628

II. COMPARATIVE LIFE TABLE OF 1,000 MALES AGED FIFTEEN YEARS.

(Continued.)

Age.	English Life Tables.			Mass.	N. Y. City.	London
	1838-54.	1871-80.	1881-90.	Life Table. 1899-37.	1899-01.	Life Table. 1891-00.
55	609	610	638	645	536	609
56	594	594	621	630	518	590
57	578	577	604	615	500	571
58	563	560	586	599	482	551
59	546	542	568	583	463	531
60	530	524	549	566	443	510
61	512	506	529	548	424	489
62	495	487	509	530	404	467
63	476	467	488	511	384	445
64	457	447	466	492	363	423
65	438	427	444	473	341	401

III. COMPARATIVE EXPECTATIONS OF LIFE. MALES, AGES 15-65.

Age.	English Life Tables.			Mass. Life Table.	N. Y. City.	London Life Table.
	1838-54.	1871-80.	1881-90.	1893-97.	1899-01.	1891-00.
15	43.2	43.4	44.5	45.1	40.2	43.4
16	42.4	42.6	43.6	44.3	39.3	42.5
17	41.6	41.8	42.7	43.5	38.5	41.7
18	40.9	41.0	41.9	42.7	37.7	40.8
19	40.2	40.2	41.1	41.9	36.8	40.0
20	39.5	39.4	40.3	41.2	36.1	39.1
21	38.8	38.6	39.5	40.5	35.3	38.3
22	38.1	37.9	38.7	39.8	34.6	37.5
23	37.5	37.2	37.9	39.1	33.8	36.6
24	36.8	36.4	37.1	38.4	33.1	35.8
25	36.1	35.7	36.3	37.7	32.4	35.0
26	35.4	35.0	35.5	37.0	31.7	34.2
27	34.8	34.2	34.8	36.3	31.1	33.3
28	34.1	33.5	34.0	35.6	30.4	32.5
29	33.4	32.8	33.3	35.0	29.7	31.7
30	32.8	32.1	32.5	34.3	29.1	30.9
31	32.1	31.4	31.8	33.6	28.4	30.2
32	31.4	30.7	31.1	32.9	27.8	29.4
33	30.7	30.0	30.3	32.2	27.1	28.7
34	30.1	29.3	29.6	31.6	26.5	28.0
35	29.4	28.6	28.9	30.9	25.8	27.3
36	28.7	28.0	28.2	30.2	25.2	26.6
37	28.1	27.3	27.5	29.5	24.6	25.9
38	27.4	26.6	26.8	28.8	24.0	25.2
39	26.7	26.0	26.1	28.1	23.3	24.5
40	26.1	25.3	25.4	27.4	22.7	23.9
41	25.4	24.7	24.7	26.7	22.1	23.2
42	24.7	24.0	24.1	26.0	21.5	22.6
43	24.1	23.4	23.4	25.3	20.9	21.9
44	23.4	22.7	22.7	24.6	20.3	21.3

III. COMPARATIVE EXPECTATIONS OF LIFE. MALES, AGES 16-65.

(Continued.)

Age.	English Life Tables.		Mass. Life Table.	N. Y. City.		London Life Table.
	1838-54.	1871-80.	1881-90.	1893-97.	1899-01.	1891-00.
45	22.8	22.1	22.1	23.9	19.7	20.7
46	22.1	21.4	21.4	23.2	19.2	20.0
47	21.5	20.8	20.8	22.6	18.6	19.4
48	20.8	20.2	20.1	21.9	18.0	18.8
49	20.2	19.6	19.5	21.2	17.5	18.2
50	19.5	18.9	18.8	20.5	16.9	17.6
51	18.9	18.3	18.2	19.9	16.4	17.0
52	18.3	17.7	17.6	19.2	15.9	16.4
53	17.7	17.1	17.0	18.6	15.3	15.9
54	17.1	16.5	16.3	18.0	14.8	15.3
55	16.5	16.0	15.7	17.3	14.2	14.8
56	15.9	15.4	15.2	16.7	13.7	14.2
57	15.3	14.8	14.6	16.1	13.2	13.7
58	14.7	14.2	14.0	15.5	12.7	13.2
59	14.1	13.7	13.4	15.0	12.2	12.6
60	13.5	13.1	12.9	14.4	11.7	12.1
61	13.0	12.6	12.3	13.8	11.2	11.6
62	12.4	12.1	11.8	13.3	10.7	11.2
63	11.9	11.6	11.3	12.8	10.3	10.7
64	11.3	11.1	10.8	12.2	9.8	10.2
65	10.8	10.6	10.3	11.7	9.4	9.8

IV. MORTALITY RATES OF THE AMERICAN POPULATION REGISTRATION AREA.
U. S. CENSUS OF 1900.

(Rates per 1,000 Living at Each Age Period.)

Ages.	1890.	1900.	Changes.	
Under 5	66.8	52.1	Decrease	14.7
5-9	7.3	5.2	"	2.1
10-14	3.8	3.3	"	.5
15-19	6.0	5.2	"	.8
20-24	8.4	7.5	"	.9
25-29	9.9	8.6	"	1.3
30-34	10.6	9.4	"	1.2
35-39	12.5	11.0	"	1.5
40-44	13.5	12.2	"	1.3
45-49	16.5	15.2	"	1.3
50-54	19.2	19.1	"	.1
55-59	26.5	26.3	"	.2
60-64	32.8	35.1	Increase	2.3
65-69	49.0	52.2	"	3.2
70-74	64.5	75.2	"	10.7
75-79	103.2	110.5	"	7.3
80-84	144.6	165.8	"	21.2
85-89	215.5	241.3	"	25.8
90-94	260.0	339.2	"	79.2
95-over	347.1	418.9	"	71.8

V. MORTALITY AND SICKNESS RATES. FRIENDLY SOCIETY EXPERIENCE, MANCHESTER ORDER OF UNITY. ODD FELLOWS (WATSON) 1893-1897.

Ages.	Annual Rate of Mortality per 1,000 Members.	Annual Rate of Sickness per Member. (Weeks.)
16-19	2.5	.92
20-24	3.7	.90
25-29	4.6	.95
30-34	5.5	1.06
35-39	7.0	1.27
40-44	9.5	1.58
45-49	11.7	1.99
50-54	16.9	2.75
55-59	24.2	4.02
60-64	35.6	6.31
65-69	54.1	10.59
70-74	80.9	17.40
75-79	120.4	25.15
80-84	176.6	32.27
85-89	232.6	36.12
90-94	284.7	38.89
95-over	440.0	38.57

VI. MORTALITY FROM ALL CAUSES IN SPECIFIED OCCUPATIONS. ENGLISH EXPERIENCE, 1890-92.

(Rate per 1,000 at each Age.)

Ages.	Profes- sional.	Agricul- tural.	General Trades and Industries.	Unhealth- ful. Trades.	Danger- ous Trades.	Unhealthful and Danger- ous Trades.	Common Labor.
15-19	2.3	1.7	2.3	3.0	4.4	3.9	2.5
20-24	4.8	3.5	4.7	5.8	6.8	5.7	5.5
25-34	5.4	4.8	6.7	8.6	9.4	6.8	9.1
35-44	9.6	7.7	11.9	15.6	14.9	10.9	16.4
45-54	16.2	12.2	20.6	26.9	26.1	20.9	26.9
55-64	29.9	24.2	37.7	49.3	47.1	45.9	43.4
65-over	94.1	92.1	105.3	125.4	123.9	146.4	113.8

VII. MORTALITY FROM CONSUMPTION IN SPECIFIED OCCUPATIONS. ENGLISH EXPERIENCE, 1890-92.

(Rate per 1,000 at each Age.)

Ages.	Profes- sional.	Agricul- tural.	General Trades and Industries.	Unhealth- ful. Trades.	Danger- ous Trades.	Unhealthful and Danger- ous Trades.	Common Labor.
15-19	1.2	0.4	0.8	1.0	0.8	0.6	0.6
20-24	2.2	1.3	2.0	2.6	1.8	1.4	2.0
25-34	2.1	1.7	2.7	3.4	2.7	1.5	3.2
35-44	2.4	2.0	3.8	4.5	3.2	2.1	4.7
45-54	2.0	1.7	4.0	4.5	3.4	2.9	4.9
55-64	1.5	1.5	3.2	3.8	2.8	3.2	3.4
65-over	0.7	1.0	1.8	2.2	1.7	2.8	2.0

VIII. MORTALITY FROM RESPIRATORY DISEASES IN SPECIFIED OCCUPATIONS.
 ENGLISH EXPERIENCE, 1890-92.

(Rate per 1,000 at each Age.)

Ages.	Profes- sional.	Agricul- tural.	General Trades and Industries.	Unhealth- ful. Trades.	Danger- ous Trades.	Unhealthful and Danger- ous Trades.	Common Labor.
15-19	0.2	0.1	0.2	0.3	0.5	0.3	0.3
20-24	0.6	0.4	0.5	0.7	1.0	0.7	0.8
25-34	0.6	0.6	1.0	1.4	1.7	1.0	1.7
35-44	1.4	1.3	2.3	3.2	3.6	2.3	3.7
45-54	2.6	2.6	4.9	6.8	7.6	6.0	7.6
55-64	4.0	5.6	10.4	14.4	15.3	16.5	13.9
65-over	15.8	20.3	27.0	34.5	34.5	47.7	32.8

IX. MORTALITY FROM ACCIDENTS IN SPECIFIED OCCUPATIONS.
 ENGLISH EXPERIENCE, 1890-92.

(Rate per 1,000 at each Age.)

Ages.	Profes- sional.	Agricul- tural.	General Trades and Industries.	Unhealth- ful. Trades.	Danger- ous Trades.	Unhealthful and Danger- ous Trades.	Common Labor.
15-19	0.1	0.3	0.3	0.3	1.4	1.6	0.4
20-24	0.2	0.3	0.3	0.3	1.6	1.6	0.6
25-34	0.2	0.5	0.4	0.4	1.6	1.8	0.8
35-44	0.3	0.5	0.5	0.6	1.9	2.1	1.1
45-54	0.3	0.6	0.8	0.8	2.3	2.8	1.5
55-64	0.6	1.0	1.1	1.1	3.0	3.2	2.0
65-over	1.0	1.6	1.9	2.2	3.9	4.1	3.4